

**BAT SURVEYS AT TUCSON MOUNTAIN DISTRICT MINE SITES  
SAGUARO NATIONAL PARK**

**DRAFT REPORT**

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## **INTRODUCTION**

Wildhorse Mine, located in the Tucson Mountain District (TMD) of Saguaro National Park, contains a summer colony of cave myotis (*Myotis velifer*). The colony was first reported in 1991 (Sidner 1991), with numbers ranging from 456 to 1554 bats. For the next 3 years, mid-season counts of 1770 to 4659 bats were reported (Sidner and Davis 1994). Since Hayward's extensive study of this species in southern Arizona in the early 1960's (Hayward 1961), the major summer colonies of cave myotis in the Tucson area have been extirpated, including the large colony of 15,000 in San Xavier Mine and the maternity colony of up to 5,000 in Pinal Crystal Cave. Since that time, there have been only reports of this species declining in and around Tucson; no additional major colonies have been found in this area. Because, in Arizona, cave myotis colonies average no more than several thousand bats, and because of the declining numbers in the Tucson area, we think Wildhorse Mine houses a significant population of this species. In fact, it currently may be the largest aggregation of cave myotis in the Tucson area.

Managers and biologists at the Park were concerned that these bats were at increased risk from human disturbance because of a recently completed trail extension in the mine's vicinity, and increasing urbanization on the east side of the Tucson Mountains. Therefore, in 1999, the Park initiated a study to test a bat-friendly gate design for Wildhorse Mine (Dalton and Wolf 2002). Natural bat activity was monitored in 1999 during evening outflights. In 2000, a temporary gate, made of PVC, was placed in the entrance of the mine, and bat activity again monitored. In 2001, the temporary gate was removed, and a steel gate was permanently installed. Again, outflights were monitored. We found that after installation of both the mockup and permanent gates, the total number of bats using the mine dropped to about half of the pre-gate peak. However, there were insufficient data to tell conclusively if the gate caused the decrease.

California leaf-nosed bats (*Macrotus californicus*) do not migrate and do not hibernate, and therefore inhabit an area year-round. A single colony of this species uses multiple roosts within a geographic area. Roost switching is common, on a daily basis, as well as between seasons (Dalton 2001). Some sites only used as night roosts may be important mating locations, used only in the fall (P. Brown, pers. comm.). Therefore, it is not sufficient to protect only a few, or the largest, sites used by a local population. Instead, all sites occupied, even intermittently, should be considered significant and viewed collectively as roost habitat when making management decisions. On a survey at Old Yuma Mine in February, 2002, we observed a small colony (about 20) of California leaf-nosed bats. During a survey of over 100 mines in the TMD, January-March, 2003, we observed this species in four other mines. Because all observations of this species in the TMD have been in winter, park managers were interested in knowing if Old Yuma Mine was used by this species (or any other species) in summer or fall.

### **Objectives**

- Census the colony of *Myotis velifer* residing in Wildhorse Mine during summer, 2003.
- Determine if Old Yuma Mine is used by *Macrotus californicus* during summer and fall, 2003.

## **STUDY AREA**

Wildhorse Mine is one of many abandoned mines in the Tucson Mountain District of Saguaro National Park. The mine is a tunnel about 250 meters long, with a single drift about 175 meters in from the entrance. The drift extends about 10 meters to the east. There is a small amount of perennial water throughout most of the mine that forms small pools in the entrance area. Collared peccaries, skunks, and canyon wrens have been observed using the entrance area of the mine, and it is assumed other species of wildlife also come to drink.

Old Yuma Mine is another abandoned mine in the Tucson Mountain District. It consists of a steep decline of roughly 70 meters. There are drifts off of the main shaft at about 35 meters depth, and again at 70 meters. The upper drift is partially collapsed, and can be accessed for about 20 meters. Across the main shaft from the upper drift is a stoped area that is mostly filled with rock debris from ceiling collapse. The lower drift is approximately 50 meters long, with three small stopes opening into it from above.

## **METHODS**

### **Bat Monitoring Techniques**

Bats can be counted by either internal or external surveys. Because they are conducted during the day when the entire colony is present, internal surveys usually cause more disturbance to the bats; therefore, external surveys should be done whenever possible (Thomas and LaVal 1988). We censused the bats at Wildhorse Mine by using a combination of external surveys, where we counted bats as they flew out in the evening to forage, and internal surveys, where we entered the roost and counted any bats remaining in the roost after normal emergence time. By adding an internal survey after emergence to our external survey, we obtained a more accurate count. It also allowed us to count the number of nonvolant young.

The external surveys at Wildhorse Mine were conducted using the infrared videotaping method described in Dalton and Wolf (2002). A camcorder (Sony model DCR-TRV19) sensitive to infrared light, supplemented by near infrared illumination (Wildlife Engineering model IRLamp6) was used to record the emergences. At a later time, we counted bats on the tape. Numbers of bats emerging were tallied on a minute-by-minute basis. Individuals re-entering the mine were subtracted from the count of those emerging. The total at the end of the emergence was then added to the count obtained from the post-emergence internal survey to produce the final total count for that night.

At Old Yuma Mine, we conducted internal surveys only. We used internal surveys because we did not know if any bats were present in summer and fall at this mine. Detecting small numbers of bats during an evening emergence would be difficult because of the structural characteristics of the site. In addition, if bats were encountered during an internal survey, positive species identification could be made either visually or by hand-netting. We used standard, accepted methods for surveying mines for bats, as recommended by Altenbach et al. (2000). We used white light to navigate for safety reasons. The lights were mounted to MSHA-approved hard hats, and backed-up with two reserve lights. We also used a gas meter (Gastech GX-82) to detect dangerous levels of gasses.

## RESULTS

### Census Results

We censused bats at Wildhorse Mine on 21 June, 5 July, 19 July, and 2 August 2003. Counts for Wildhorse Mine ranged from 1719-2379 (Table 1). Figure 1 is a summary of all known census counts at Wildhorse Mine.

We surveyed Old Yuma Mine on 8 June, 13 September, and 23 November 2003. There were no bats observed on either 8 June or 23 November. On 13 September, one cave myotis was observed. No other bats were present.

Table 1. Emergence counts conducted during 2003 for cave myotis in Wildhorse Mine.

| DATE          | TIME TO EMERGE<br>(min) | NUMBER OF BATS                                      |
|---------------|-------------------------|-----------------------------------------------------|
| 21 June 2003  | 32                      | 1619, plus est. 100 adults and 2 newborn inside     |
| 5 July 2003   | 40                      | 1581, plus est. 100 adults, 4 juv, 1 newborn inside |
| 19 July 2003  | 40                      | 2329, plus est. 50 adults inside                    |
| 2 August 2003 | 25                      | 1995, plus est. 20 adults inside                    |

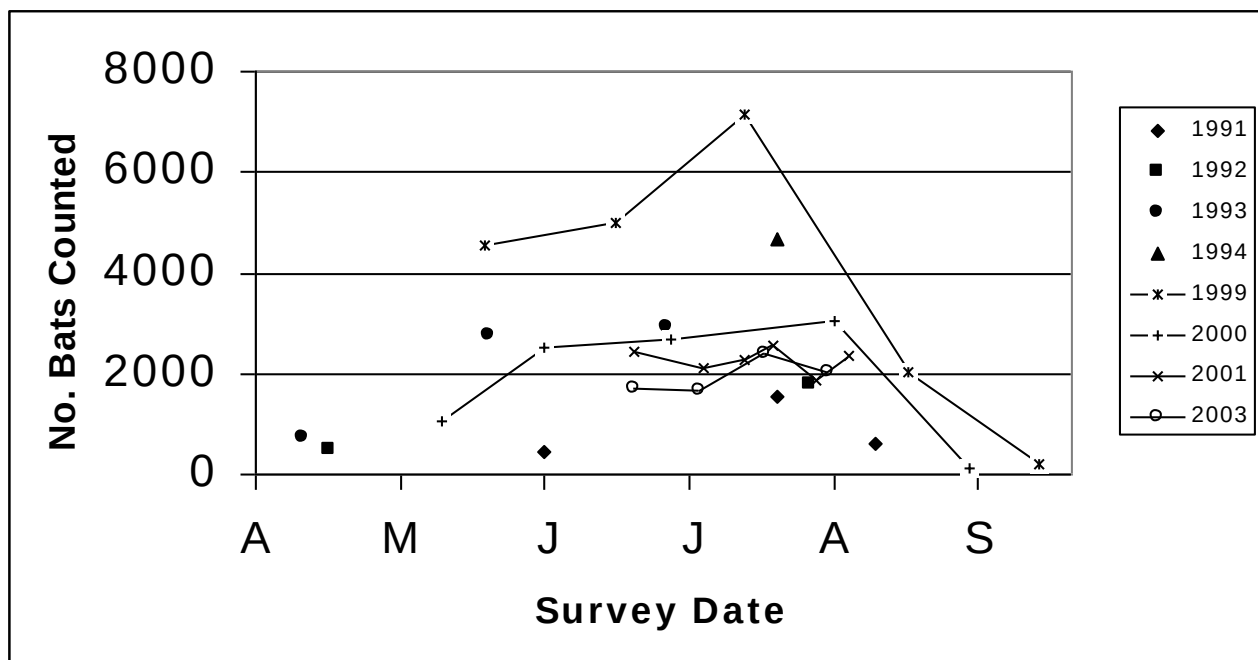


Figure 1. A summary of all known census counts at Wildhorse Mine. Data for 1991 are from Sidner (1991) and for 1992-4 are from Sidner and Davis (1994). Data for 1999-2001 are from Dalton and Wolf (2002).

## **RECOMMENDATIONS**

### **Wildhorse Mine**

Monitoring Wildhorse Mine should continue for at least the next two seasons. We recommend conducting weekly surveys from the end of June to the beginning of August. This protocol should capture the natural variation in colony size as well as the peak seasonal abundance. The data we now have on this colony suggests the gate may impose an upper limit on the size of the colony. To test this hypothesis, one or two bars could be removed from the gate for the next two or three seasons, while monitoring continues. An increase in numbers would support this hypothesis.

To gain a better understanding of roost-switching, nearby known roosts should also be monitored to determine if numbers fluctuate at those roosts, and to determine if these fluctuations are correlated with the Wildhorse Mine numbers. This would be accomplished by simultaneous counts. In the mid-1990's, there was only one other significant roost of cave myotis, the 400 Yard Mine, known in the Tucson Mountains. We do not know if bats still occupy this site.

The existence of undiscovered roosts in the area cannot be discounted and would certainly affect the validity of roost-switching data. Therefore, it is also recommended that a search for additional roost sites be conducted in the Tucson Mountain District of Saguaro National Park and surrounding areas. Finding and monitoring other colonies of cave myotis in the Tucson area will increase our understanding of the population dynamics of the colony residing in Wildhorse Mine.

### **Old Yuma Mine**

Based on our survey data to date, the Old Yuma Mine appears to be used by California leaf-nosed bats only in winter. During a survey of mines in winter 2003 (Wolf and Dalton 2003), we found over 100 California leaf-nosed bats in one mine, and groups of over 20 animals in three other mines, all within the TMD. This species has also been observed in mines in Tucson Mountain Park (TMP) (D. Carter, Ranger, pers. comm.). These sites probably represent part of a network of mines, and possibly natural caves, used by a single population of this species. This network of roosting sites is likely entirely contained within the Tucson Mountains. We recommend that Old Yuma Mine be surveyed every other year (to minimize disturbance) to verify the stability of the resident colony. The survey should be conducted in January or February. We also recommend that surveys of abandoned mines continue in the TMD, and on adjacent lands managed by TMP and the Bureau of Land Management, in an attempt to locate additional roosts.

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## APPENDIX A

Graphs of all videotaped emergence counts. The X axis is emergence time, and the Y axis is the number of bats.

